

BRIEF

I. Current legal criteria for obviousness

5 (1) Suggestion or teaching to combine prior art

There are three possible sources for a motivation to combine references to establish a legal conclusion of obviousness: (i) the nature of the problem to be solved; (ii) the teachings of the prior art; and (iii) the knowledge of persons of ordinary skill in the art.

Manual of Patent Examination Procedure 2143.01 (Eighth Ed. Rev.2 May 2004)

10 [hereinafter MPEP].

The fact that one skilled in the art could modify prior art in a manner alleged by the government does not make such modification obvious. Instead, prior art must suggest the desirability of a particular modification. In re Fritch, 972 F.2d 1260, 1266, 23 U.S.P.Q.2d 1780, 1783-84 (Fed. Cir.1992) (flexible landscape edging device not suggested by
15 hindsight combination of prior art). The prior art must also suggest the reasonable success of a particular modification. MPEP 2143.02.

(2) The claimed invention as a whole must be obvious

20 When determining differences between prior art and the applicant's claims, the correct inquiry is whether the claimed invention *as a whole* would have been obvious. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 1537, 218 U.S.P.Q. 871, 877 (Fed. Cir. 1983) (emphasis added).

25 (3) The prior art cannot teach away from the claimed invention

A *prima facie* case of obviousness is rebutted by prior art which, in any material respect, teaches away from the claimed invention. MPEP 2141.02. A claimed combination cannot change the principle of operation of the primary prior art reference or render the reference inoperable for its intended purpose. See In re Ratti, 270 F.2d 810, 813, 123 U.S.P.Q. 349, 351-52 (C.C.P.A. 1959)(references taught rigid devices whereas the claimed invention required resiliency). A reference which teaches away from the claimed invention does not teach a combination of references which suggest that invention. See In re Fine, 837 F.2d 1071, 1074, 5 U.S.P.Q.2d 1596, 1599 (Fed. Cir. 1988).

(4) All claim limitations are considered

All claim limitations must be suggested by the government's prior art. MPEP section 2143.03. When evaluating a claim for obviousness, the government must consider all claim language. In re Wilson, 424 F.2d 1382, 1385, 165 U.S.P.Q. 494, 496 (C.C.P.A. 1970). If an independent claim is non-obvious, then any claims depending therefrom are non-obvious. In re Fine, 837 F.2d at 1076. Additional features of a claim are not obvious if they provide additional advantages to consumers. Symbol Technologies, Inc. v. Opticon, Inc., 935 F.2d 1569, 1581, 19 U.S.P.Q.2d 1241, 1250 (Fed. Cir. 1991) (second patent's claims recited additional features which achieve further advantages).

(5) Undue experimentation

An invention is not obvious where the prior art gives no direction as to which of many possible experimental choices may be successful. See Boehringer Ingelheim Vetmedica,

Inc. v. Schering–Plough Corp., 166 F. Supp.2d 19, 37 (D.N.J.2001), *affirmed* 320 F.3d 1339, 1354 65 U.S.P.Q.2d 1961, 1971 (Fed. Cir. 2003).

(6) Inherency

5 An inherent property is a necessary feature or result of a prior art embodiment (which is itself sufficiently described). MPEP 2112 II. Inherency is not established by probabilities or possibilities. MPEP 2112 IV. The government must reasonably support a determination that an allegedly inherent characteristic necessarily results from prior art teachings. MPEP 2112 IV.

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Non-obviousness may depend upon unexpected advantages from inherent properties which an invention enhances. In re Adams, 356 F.2d 998, 1002-03, 148 U.S.P.Q. 742, 745-46 (C.C.P.A.1966) (prior art did not suggest the unexpected increase in heat transfer *efficiency* of aqueous foam in applicant’s device, although the industry knew that this
15 foam *per se* transfers heat) (emphasis added). In these cases the advantageous inherent physical property is maximized by the invention’s design, structure or function. *Id.* (the new device producing aqueous foam was designed to reduce splashing and increase contact of aqueous foam with a rounded container surface).

20 Even if a change appears small, the invention which contains the change is non-obvious if the change provides previously unknown practical uses. *See Intel Corp. v. U.S. Int’l Trade Commission*, 946 F.2d 821, 20 U.S.P.Q.2d 1161, 1173 (Fed.Cir.1991). Disclosed inherent properties are also part of the “as a whole” inquiry. MPEP 2141.02. Parameters

which successfully optimize an inherent property are non-obvious if the prior art did not recognize these parameters as result-effective variables. *Id.*

(7) Official Notice

5 The government must support technical assertions of official notice with technical evidence. MPEP 2144.03. Official notice is inappropriate without a prior art reference whenever the asserted facts are not capable of instant and unquestionable demonstration. MPEP 2144.03A. The government's assertion of technical facts must be supported by a reference work which is recognized as a standard in the pertinent art. MPEP 2144.03A.

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II. The Government's Prior Art References

Applicant has reviewed the complete original research articles on which the government's abstracts are based:

15 1. Yao-Chi Lu et al, "Economic Analysis of Sustainable Agricultural Cropping Systems for Mid-Atlantic States," **Journal of Sustainable Agriculture** 15(2-3): 77-93 (1999)[hereinafter "Lu"]. This study evaluates the profitability of: (1) no tillage systems with chemical fertilizers and herbicides; (2) no tillage systems with crown vetch living mulch; (3) no-tillage systems with a winter annual cover crop; and (4) a reduced tillage
20 manure based system without chemical fertilizers but containing green manure. Lu, pages 81-82.

The experimental design comprised a randomized complete block with four smaller blocks. Each block contained four cropping systems assigned permanently to two plots.

25 Plot pairs alternated between the corn and wheat/soybean phases of rotation, so two

phases of rotation occurred annually for each cropping system. *Id.*, page 80, third paragraph.

The crown vetch system followed similar guidelines for the conventional no tillage system presently in widespread use, except crops grow within a perennial crown vetch living mulch. *Id.*, page 81, third paragraph.

The crop covers system applied winter annual species hairy vetch prior to corn and wheat before soybean. Because there was insufficient time to plant hairy vetch following a wheat/soybean double crop, a full season soybean crop was grown between May and September to permit time to plant hairy vetch in October. Crops were planted into cover crops without tillage. Pre-emergence herbicides were eliminated and only post-emergence herbicides were used as needed. Only planter and side dress nitrogen were applied. *Id.*, page 81, fourth paragraph.

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2. T.K. Iragavarapu et al., “Border Effects on Yields in a strip-intercropped soybean, corn and wheat production system,” **Journal of Production Agriculture** 9(1): 101-107(1996)[hereinafter “Iragavarapu”]

This study compared grain yield of soybeans and corn in a three –crop system, to that of a two crop corn–soybean system. Iragavarapu, page 102, second paragraph. The goal of the study was to determine optimization of yields in three crop intercropped strip models, in lieu of two crop intercropped strip models or the classic monocrop model. Field experiments were conducted from 1991 through 1994 at two sites in southern Minnesota.

Rows were oriented east/west at one site and north-south at the second, and the soil type was poorly drained. Soybeans were grown on ridges in all strips at both sites in 1990.

Id., third paragraph.

5 Iragavarapu planted wheat, corn and soybeans as strip intercroppings on these ridges. Each crop was planted in a 15-ft wide by 120 foot long strip, with six rows each of corn and soybeans and 21 rows of wheat per strip. Crops were rotated each year so corn followed wheat, soybean followed corn and wheat followed soybean. Corn and soybean were also planted and rotated in a two-crop alternate strip system within each replication at both
10 locations. *Id.* fourth paragraph.

Corn “pioneer hybrid 3751” and soy bean “Sturdy” were planted on the same day in 30 inch rows with a six row planter on ridges which were scalped to remove one to two inches of soil and previous crop residue. Soybean was planted at 9 to 10 seeds/foot of
15 row. Spring wheat “Grandin” was planted at 94 pounds per acre directly into the soybean stubble without secondary tillage and using a no till drill following an application of 50 pounds N/acre as ammonium nitrate.

Alachlor and cyanazine were applied as pre-emergence herbicides for corn. For soybeans,
20 alachlor was applied at pre-emergence, and imazethapyr was applied at the first trifoliate stage. Bromoxynil was broadcast to wheat before flagleaf stage to control broadleaf weeds. *Id.*, page 103, first paragraph, last sentence.

25 III. Amended Claims 1-7 and 10 are not obvious based upon Iragavarapu et al. in view of Lu et al.

Amended Claim 1

5 *There are no suggestions in Iragavarapu in view of Lu for the amended claim 1 method.*

According to the government Iragavarapu discloses a method for intercropping corn and soybeans. March 22, 2005 Office Action, page 5, first paragraph. It also contends that Lu discloses an ‘annual green manure crop,’ and the government assumes that this term is the agricultural and horticultural equivalent of a ‘winter annual cover crop.’ *Id.* The

10 government has no technical support for these assumptions, and Applicant cannot identify the term “winter annual cover crop” within Lu. MPEP 2144.03. Furthermore, claim meaning is defined by the specification. MPEP 2111.01. Applicant’s specification defines an annual green manure crop, but not a winter annual cover crop.

15 The government also contends that it is obvious to plant green manure in two portions and similarly to Lu, Applicant’s green manure is harvested prior to seeding of the commercial spring-planted crop. March 22, 2005 Office Action, page 5, first paragraph. However, Lu planted his commercial crops within perennial viable crown vetch. Lu, page 81, third paragraph. In fact, Lu’s perennial crown vetch is planted after a wheat harvest
20 and remains viable during a two year period. Under these circumstances, the perennial crown vetch is not necessarily harvested prior to seeding of the commercial crop, and in fact may not be harvested at any time. *Id.*

Furthermore, amended Claim 1 recites combined green manure and combination mulch
25 which is applied to pre-selected soil at (1) different depths and (2) different dates during

the growing season. Lu discloses a cover crop system with hairy vetch planting during October, but neither first nor second portions containing mowed hairy vetch or any other cover crop are disclosed or suggested. *Id.* page 81, third paragraph. There are also no subsequent dates for addition of hairy vetch or crown vetch as a combination mulch.

5

Lu's manure/crimson clover system also does not disclose growth and application of (1) two portions of any plant for soil treatment (2) at two different dates during the growing season. *Id.*, page 82, first paragraph. Lu's no tillage system does contain a green manure planting or green manure in any form, *id.*, second paragraph, and his manure-based
10 system contains crimson clover to overseed into soybeans. Neither the clover nor soybeans are divided into portions or allocations in Lu's disclosure. Lu, page 82, first paragraph. Based upon Lu, a third party skilled in the art would not be inclined to diverge from the practice of growing green manure plants and applying them to the soil at one date and at one soil level.

15

The government has not specified the exact passage of Lu which suggests that first and second portions are leaves and stems, respectively. According to Lu's full text article, hairy vetch, crown vetch and crimson clover become ground covers in their entirety, and not as a first combined mulch portion or a second combined green manure portion. *See In*
20 *re Fritch*, 972 F.2d at 1266 (flexible landscape edging device not suggested by hindsight combination of prior art); MPEP 2143.02 (the prior art must suggest the reasonable success of a particular modification).

In addition, Applicant's specification defines a first or second portion of combined green manure as follows:

Application, paragraph 21 ("green manure *plants*"),

Application, paragraph 65 (harvesting a *portion* of the green manure *plants* 44a for mulch
5 20; quick tilling a *portion* of green manure *plants* 44a and organic debris 19 into the soil
45).

Application, paragraph 66 (The farmer next mows green manure *plants* 44a and plant
debris 19, which becomes combination mulch 20....")

Application, paragraph 78 ("The approximately one-half of wheat grass 18a is chopped
10 and blended with organic debris 19 to become combined mulch 20.... The remaining
approximately one-half of the bottom portions of... (such as wheat grass 18a) is tilled
into soil 45 with organic debris 19....")

Based upon this express language, the first and second portions of original and amended
Claim 1 are not exclusively leaves and stems respectively as the government contends.

15 MPEP 2111.01 I, III.

Amended Claim 1 also recites (1) the components of the organic residue, (2) annual
green manure plants which remain unmowed until tillage; and (3) application of
combined green manure approximately nine to fourteen inches into said soil. Application,
20 paragraphs 6, 26 and 66. The government must specify which passages from the full text
of Lu and Iragavarapu suggest these features.

Furthermore, Iragavarapu's goals are (1) maximizing grain yields with wheat between
25 corn and soybean and soybean strips; and (2) grain yield of soybean and corn in three

crop systems, compared to exclusively two crop corn-soybean systems. Lu's goal is assessment of profitability of different cropping systems with minimum tillage. Based upon these two references, one skilled in the art would not be expected to combine (1) a system with no green manure/mulch system, with (2) a system which relies upon minimum tillage systems with or without a green manure or mulch. *See In re Fine*, 837 F.2d at 1076 (purposes of two temperature ranges are entirely unrelated, so prior art did not teach use of claimed range).

Amended Claim 1 as a whole must be obvious

The government has not addressed the features of amended claim 1 such as: mowing of green manure plants immediately prior to tillage; use of a single portion of the green manure plants and organic debris as combined mulch; the composition of the organic debris; and spraying of combined mulch upon the soil surface after seeding commercial crops. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d at 1537. Lu and Iragavarapu do not suggest spraying mulch at a specific depth, after tilling viable combined green mulch which contains intact soybean roots and nodules, when the invention is considered as a whole.

The prior art teaches away from the claimed invention

Iragavarapu teaches away from amended Claim 1 because he applies ammonium nitrate, cyanazine, alachlor, bromoxynil and imzaethapyr to commercial crops of corn and soybeans. Similarly Lu teaches away from amended Claim 1 because his (1) no-tillage method does not include any form of green manure; (2) no-tillage method includes

artificial fertilizer; and (3) no-tillage, crown vetch and cover crop systems include herbicides. Lu, page 81, second, third and fourth paragraphs.

In contrast, amended Claim 1 expressly excludes artificial fertilizer, pesticides and herbicides. Application, paragraph 4; MPEP 2141.02; *see also In re Ratti*, 270 F.2d at 813 (references taught rigid devices whereas the claimed invention required resiliency; *In re Fine*, 837 F.2d at 1074 (a reference which teaches away from the claimed invention cannot be combined to suggest the invention).

10 *The government did not consider all claim limitations and language*

The government has not considered all the limitations of amended Claim 1 which include: the specific depth of combined green manure in the soil; absence of fertilizers, both biological and artificial; and two portions of combined green manure plants and organic residue which are applied at different stages and at different soil levels for seeding of commercial crops. *In re Wilson*, 424 F.2d at 1385 (all claim language must be considered).

Furthermore, a modification such as the absence of fertilizers, pesticides and herbicides, is tremendous advantage, because the cost for raising commercial crops is significantly lower. There are also are short-term and long-term ecological benefits which result in less accumulation of chemicals within soil, water and crops. *See Symbol Technologies, Inc. v. Opticon, Inc.*, 935 F.2d at 1581 (second patent's claims recited additional features which achieve further advantages). Even if the changes appeared deceptively small, amended Claim 1 features such as composition of organic debris, as well as timing and

depth of combined mulch and combined green manure within the soil, provide previously unknown practical uses (such as more productive growing seasons without fertilizer and herbicide costs). See Intel Corp. v. U.S. Int'l Trade Commission, 20 U.S.P.Q.2d at 1173.

5 *Inherency*

Amended Claim 1 features which do not inevitably result from Iragavarapu in view of Lu include:

- (a) an organic residue containing desiccated intact soybean roots and nitrogen nodules;
- (b) a first portion and a second portion of combined green manure plants and organic
- 10 residue which are applied to the soil at different depths and at different stages of seeding the commercial crops;
- (c) an annual green manure crop containing green manure plants which remain unmowed until tillage and seeding of commercial crops;
- (d) absence of artificial pesticides, herbicides or fertilizer; and
- 15 (e) absence of manure.

Since inherency is not mere possibility, MPEP 2112 IV., features such as desiccated intact soybean roots and nitrogen nodules do not necessarily result from the general features of intercropping, strip cropping, or use of a green manure within the government's references. MPEP 2112 II.

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Furthermore, although the benefits of mulch and green manure are known, no one could predict increased soil productivity at lower cost, from the amended Claim 1 method which enhances the benefits of green manure plants and organic residue as both a

combined green manure and a combined mulch. *See In re Adams*, 356 F.2d at 1002-03 (prior art did not suggest the unexpected increase in heat transfer *efficiency* of aqueous foam in applicant's device, although those in the art knew that this foam *per se* transfers heat) (emphasis added).

5

Undue experimentation

Iragavarapu in view of Lu does not suggest parameters such as combined mulch composition, combined green manure composition, fertilizer, herbicides, and timing of tillage. *See Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp.*, 166 F.

10 Supp.2d at 37, 320 F.3d at 1354 (an invention is not obvious where the prior art gives no direction to the successful experimental parameters).

Official Notice

The government has not provided technical evidence to support its statement that its
15 references suggest an annual green manure crop in two portions combined with intact organic residue. MPEP 2144.03; MPEP 2144.03A. In fact there are potential methods in which green manure plants are not combined with organic residue, or in which the organic residue in the soil differs from the composition of amended Claim 1.

20 **Amended Claim 2**

Applicant incorporates his entire analysis *supra* for the non-obviousness of amended Claim 1 herein. If independent amended Claim 1 is non-obvious then amended Claim 2 depending therefrom is also non-obvious. *In re Fine*, 837 F.2d at 1076. In addition, an
25 intercropped legume is only one element of amended Claim 2. The government must

address amended Claim 2 as a whole and all amended Claim 2 language. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d at 1537; In re Wilson, 424 F.2d at 1385.

For obviousness, Iragavarpu and Lu must suggest the combined method of amended
5 Claim 1 and not merely disclose intercropped legumes. *See In re Fritch*, 972 F.2d at 1266; MPEP 2143.02; Ecolochem, Inc. v. Southern California Edison Co., 56 U.S.P.Q.2d 1065, 1075 (Fed. Cir. 2000) (a reference by reference, limitation by limitation analysis does not demonstrate how prior art teaches the claimed combination).

10 **Amended Claim 3**

Applicant incorporates his entire analysis *supra* for the non-obviousness of amended Claim 1 herein. If independent amended Claim 1 is non-obvious, then amended Claim 3 depending therefrom is also non-obvious. In re Fine, 837 F.2d at 1076.

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In addition, intercropped soybeans are only one element of amended Claim 3. The government must address amended Claim 3 as a whole and all amended Claim 3 language. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d at 1537; In re Wilson, 424 F.2d at 1385. Iragavarpu and Lu must also suggest the combined method of amended Claim 3
20 and not merely intercropped soybeans which are present in other contexts in prior art. *See In re Fritch*, 972 F.2d at 1266; MPEP 2143.02; Ecolochem, Inc. v. Southern California Edison Co., 56 U.S.P.Q.2d at 1075 (reference by reference, limitation by limitation analysis does not demonstrate how prior art teaches the claimed combination).

The government must also explain exactly how amended Claim 3 inevitably results from its prior art, and how amended Claim 3 is created by those skilled in the art without undue experimentation. *See In re Adams*, 356 F.2d at 1002-03; Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp., 166 F. Supp.2d at 37, 320 F.3d at 1354.

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Amended Claim 4

Applicant incorporates his entire analysis *supra* for the non-obviousness of amended Claim 1 herein. If independent amended Claim 1 is non-obvious then amended Claim 4 depending therefrom is also non-obvious. In re Fine, 837 F.2d at 1076.

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In addition, intercropped corn is only one element of amended Claim 4. The government must address amended Claim 4 as a whole and all amended Claim 4 language. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d at 1537; In re Wilson, 424 F.2d at 1385. Iragavarpu and Lu must suggest the combined features of amended Claim 4 and not merely intercropped corn which is an isolated element in another context in the prior art. *See In re Fritch*, 972 F.2d at 1266; MPEP 2143.02; Ecolchem, Inc. v. Southern California Edison Co., 56 U.S.P.Q.2d at 1075.

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The government must also explain exactly how amended Claim 4 inevitably results from its prior art, and how amended Claim 4 is created by those skilled in the art without undue experimentation. *See In re Adams*, 356 F.2d at 1002-03; Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp., 166 F. Supp.2d at 37, 320 F.3d at 1354.

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Amended Claim 5

Applicant incorporates his entire analysis *supra* for the non-obviousness of amended Claim 1 herein. If independent amended Claim 1 is non-obvious, then amended Claim 5 depending therefrom is also non-obvious. In re Fine, 837 F.2d at 1076.

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Furthermore, intercropped soybeans and corn are only two elements of amended Claim 5. The government must address amended Claim 5 as a whole and all amended Claim 5 language. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d at 1537; In re Wilson, 424 F.2d at 1385. Iragavarpu and Lu must also suggest the combined features of amended Claim 5 and not merely intercropped soybeans and corn in other contexts from prior art. *See In re Fritch*, 972 F.2d at 1266; MPEP 2143.02; Ecolochem, Inc. v. Southern California Edison Co., 56 U.S.P.Q.2d at 1075.

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The government must also explain exactly how amended Claim 5 inevitably results from its prior art, and how amended Claim 5 is created by those skilled in the art without undue experimentation. *See In re Adams*, 356 F.2d at 1002-03; Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp., 166 F. Supp.2d at 37, 320 F.3d at 1354.

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Amended Claim 6

Applicant incorporates his entire analysis *supra* for the non-obviousness of amended Claim 1 herein. If independent amended Claim 1 is non-obvious then amended Claim 6 depending therefrom is also non-obvious. In re Fine, 837 F.2d at 1076.

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Furthermore, intercropped soybeans and corn are only two elements of amended Claim 6.

The government must address amended Claim 6 as a whole, as well as all the amended Claim 6 language. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d at 15, 37; In re Wilson, 424 F.2d at 1385. Iragavarpu and Lu must also suggest the combined features of amended
5 Claim 6 and not merely exclusively intercropped soybeans and corn as an isolated element in other contexts from prior art. *See* In re Fritch, 972 F.2d at 1266; MPEP 2143.02; Ecolochem, Inc. v. Southern California Edison Co., 56 U.S.P.Q.2d at 1075.

The government must also explain exactly how amended Claim 6 inevitably results from
10 its prior art, and how amended Claim 6 is created by those skilled in the art without undue experimentation. *See* In re Adams, 356 F.2d at 1002-03; Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp., 166 F. Supp.2d at 37, 320 F.3d at 1354.

Amended Claim 7

15 Applicant incorporates his entire analysis *supra* for the non-obviousness of amended Claims 1 and 6 herein. If independent amended Claim 1 is non-obvious then amended Claim 7 depending therefrom is also non-obvious. In re Fine, 837 F.2d at 1076.

Furthermore, an alternating pattern for soybeans and corn is only one element of
20 amended Claim 7. The government must address amended Claim 7 as a whole and all amended Claim 7 language. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d at 1537; In re Wilson, 424 F.2d at 1385. Iragavarpu and Lu must suggest the combined features of amended Claim 7 and not merely the isolated element of alternating seeded soybeans and

corn from other contexts in prior art. *See In re Fritch*, 972 F.2d at 1266; MPEP 2143.02; *Ecolochem, Inc. v. Southern California Edison Co.*, 56 U.S.P.Q.2d at 1075.

The government must also explain exactly how amended Claim 7 inevitably results from
5 its prior art, and how amended Claim 7 is created by those skilled in the art without
undue experimentation. *See In re Adams*, 356 F.2d at 1002-03; *Boehringer Ingelheim*
Vetmedica, Inc. v. Schering-Plough Corp., 166 F. Supp.2d at 37, 320 F.3d at 1354.

Amended Claim 8

10 The government did not specifically address its Claim 8 rejection in its first office action.
However, Applicant incorporates his entire analysis *supra* for the non-obviousness of
amended Claims 1 herein. If independent amended Claim 1 is non-obvious, then
amended Claim 8 depending therefrom is also non-obvious. *In re Fine*, 837 F.2d at 1076.

15 Furthermore, buckwheat as a green manure crop is only one element of amended Claim
8. The government must address amended Claim 8 as a whole, as well as all amended
Claim 8 language. *Stratoflex, Inc. v. Aeroquip Corp.*, 713 F.2d at 1537; *In re Wilson*, 424
F.2d at 1385. Iragavarpu and Lu must suggest the combined features of amended Claim 8
and not merely buckwheat in other prior art contexts. *Ecolochem, Inc. v. Southern*
20 *California Edison Co.*, 56 U.S.P.Q.2d at 1075.

The government must also explain exactly how amended Claim 8 inevitably results from
its prior art, and how amended Claim 8 is created by those skilled in the art without

undue experimentation. See In re Adams, 356 F.2d at 1002-03; Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp., 166 F. Supp.2d at 37, 320 F.3d at 1354.

Amended Claim 10

5 Applicant has amended Claim 9 to include all the limitations of original Claim 1 and the original intervening claims. He has also modified the claim language pursuant to the government's requests under section 112, second paragraph. March 22, 2005 Office Action, page 6, Allowable Subject Matter. Claim 9 is now allowable and amended Claim 10 depends from Claim 9. If independent amended Claim 9 is non-obvious, then
10 amended Claim 10 depending therefrom is also non-obvious. In re Fine, 837 F.2d at 1076.

Amended Claims 11-13

Claims 11-13 are now amended to include all the limitations of amended Claim 1 and
15 intervening claims pursuant to the government's requests. March 22, 2005 Office Action, page 6, Allowable Subject Matter. In addition amended Claim 9 is now allowable and amended Claims 11-13 depend from Claim 9. If independent amended Claim 9 is non-obvious then amended Claims 11-13 depending therefrom are also non-obvious. In re Fine, 837 F.2d at 1076.

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Amended Claim 14

The government did not address original Claim 14 in its office action, but amended Claim 14 is non-obvious for the following reasons:

The government's prior art does not suggest the amended Claim 14 invention.

Amended Claim 14 includes the following features:

- (1) planting of a commercial legume crop during the summer to form organic debris
5 within preselected soil,
- (2) no-till planting of buckwheat and wheat over the same soil during the following fall;
- (3) mowing of the buckwheat and wheat in the spring,
- (4) tilling a second portion of buckwheat and wheat with organic debris into the same
 soil,
- 10 (5) producing combination mulch with the first portion of buckwheat, wheat and organic
 debris by using a bale chopper,
- (6) creating consecutive corn rows, each of which are seeded with corn within furrows
 and which corn rows also contain three subrows of soybean seeds,
- (7) use of a modified seed drill and forklift attached to the seed drill, as well as a corn
15 planter which produces corn furrows at lateral intervals of thirty inches.

Iragavarapu does not suggest these features, because he planted three crops-- wheat, corn
and soybeans-- simultaneously upon ridges as commercial crops. Iragavarapu, page 103,
Materials and Methods, second paragraph.

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In contrast, the amended Claim 14 method requires (1) planting of only corn and
soybeans as the commercial crops, (2) planting a preliminary legume crop planted almost
one growing season prior to seeding of corn and soybeans as commercial crops, and (3)

planting wheat and buckwheat the following fall as green manure plants, and not simultaneously with corn and soybeans as a commercial crop. Application, paragraphs 72, 74, 78, 80, 84, 93 and 92-97. There is no disclosure of a modified bale chopper or other modified machinery of any kind for the amended Claim 14 method in Iragavarapu.

5 Application, paragraphs 123, 129, 134 and 139.

Without the goal of modifying machinery for efficient use of the farmer's time and current investment, Iragavarapu has no suggestion for the reasonable success and desirability of modifying farm tools to enhance productivity. MPEP 2143.02.

10 Furthermore, Ivaragrapu uses ridges, and not furrows and soybean areas, for the commercial crops.

Lu's four cropping systems, alone or in combination with Iragavarapu, do not suggest amended Claim 14 because:

- 15 (1) His non-tillage system does not apply tillage in any manner and does not use mulch or green manure in any form or combination, In re Fritch, 972 F.2d at 1266;
- (2) The crownvetch system does not apply tillage in any manner and there is no green manure of any form. Moreover, unlike Applicant's buckwheat and wheat Lu's crownvetch remains perennial living mulch which is never mowed. Instead, Lu's commercial crops are seeded into the viable crownvetch which remains viable
- 20 throughout the growth of the commercial crops. Lu, page 81, third paragraph.
- (3) The cover crop system uses hairy vetch as a cover crop and nitrogen source for corn, but the corn and soybeans are planted into the hairy vetch without tillage;

(4) The manure-based system uses crimson clover as an additional green manure to animal manure. However, no tillage is disclosed for this the method, and there is no disclosure of clover divided into portions for green manure or mulch. *Id.* page 82, first paragraph. See MPEP 2143.02(the prior art must suggest the reasonable success of a modification).

Iragavarapu in view of Lu does not suggest amended Claim 14 as a whole

Iragavarapu discloses a method in which wheat, corn and soybeans are seeded simultaneously in strips along ridges “with six rows each of corn and soybean and 21 rows of wheat per strip.” Iragavarapu, page 102, Materials and Methods, second paragraph; Figure 1. This pattern does not suggest amended Claim 14 as a whole, because these features of Iragavarapu are merely isolated elements. Furthermore, these strips are not designed so a modified seed drill and a corn planter deposit soybean seeds and corn seed within a single pass. Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d at 1537.

Iragavarapu in view of Lu does not suggest all amended Claim 14 limitations

Neither Iragavarapu nor Lu disclose any modified machinery for growing, seeding, mowing and blending the plant combinations of amended Claim 14. Lu discloses cropping methods which include mulch and green manure. However, these features are isolated elements which must be combined and reviewed with the remaining language of amended Claim 14. For example, the government must address the modified machinery for seeding corn and soybeans, as well as the modified machinery for producing combined mulch. Furthermore, Lu’s viable crownvetch and clover/manure systems do

not suggest the desirability of mowing and chopping the green manure plants with organic debris. In re Wilson, 424 F.2d at 1385.

Iragavarapu in view of Lu teaches away from amended Claim 14

5 Amended Claim 14 recites planting of wheat and buckwheat as green manure plants, while Iragavarapu discloses wheat planted simultaneously with corn and soybean, and not as a green manure plant. Lu's first cropping system does not include a mulch, and his second and third systems require mulches which are not quick-tilled into the soil prior to planting of corn and soybeans. Although his fourth system includes crimson clover as a
10 green manure, it supplements animal manure. There is also is no disclosure of the time of seeding of the clover or its subsequent collection from the field.

Significantly, neither Lu nor Iragavarpu teach an initial legume crop which is planted earlier than the annual green manure plants within the same predetermined soil. This
15 lack of the initial step of amended Claim 14 is clear evidence of teaching away, because one skilled in the art would not be prompted to (for example) (1) plant a legume which is left intact prior to planting of the green manure crop in the fall; or (2) quick-till mowed wheat and buckwheat into the soil prior to seeding of corn and soybeans in consecutive lateral patterns, based upon the government's prior art. MPEP 2141.02; In re Ratti, 270
20 F.2d at 813 (references taught rigid devices whereas the claimed invention required resiliency); *see also* In re Fine, 837 F.2d at 1074.

Furthermore, the government's references do not suggest combining and modifying machinery to more efficiently intercrop two commercial crops in terms of cost and time.

See Symbol Technologies, Inc. v. Opticon, Inc., 935 F.2d at 1581 (second patent's claims recited additional features which achieve further advantages); see also Intel Corp. v. U.S. Int'l Trade Commission, 20 U.S.P.Q.2d at 1173.

5 *Undue Experimentation*

Iragavarapu in view of Lu contains no passages with possible parameters for successfully modifying particular machinery, timing of planting legumes, or when or how to allocate particular plants and organic debris for green manure and mulch to obtain amended

Claim 14. See Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp., 166 F.

10 Supp.2d at 37, 320 F.3d at 1354 (an invention is not obvious where the prior art gives no direction to the successful experimental parameters).

Iragavarapu in view of Lu does not teach inherency of amended Claim 14

Mulch and green manure are well recognized as beneficial for growing crops such as

15 soybeans and corn. Ghaffarzadeh et al, "Economic and biological benefits of intercropping bereem clover," **Journal of Production Agriculture**, 10:314-319, 315,

col.1, third paragraph (1997). However, it is the specific manner in which amended

Claim 14 applies mulch and green manure, and how they are produced and combined with other materials, which results in improved soil. It is also well known that

20 planting commercial crops in strips is beneficial to the soil. However, it is the specific manner in which Applicant has combined corn furrows and subrows of soybeans which contributes to simultaneously seeding of corn and soybeans in one pass.

Similarly the manner in which the machinery is used, as well as structural modifications and combination with other machinery, results in a more efficient method to seed intercropped corn and soybeans. *See In re Adams*, 356 F.2d at 1002-03. The specific manner in which combination mulch flows directly from a forage box wagon, reduces the
5 time and labor required to move green manure plants from the wagon to the bale chopper.
See id.

These maximizing features of amended Claim 14 do not inevitably result from prior art embodiments such as Iragavarapu in view of Lu. MPEP 2112 II.
10 MPEP 2141.02 (parameters which are successfully optimized to enhance an inherent property are non-obvious if the prior art did not recognize these parameters as result-effective variables). In this case, the result-effective variables included: modification of machinery, new combinations of machinery; the planting of a summer legume left intact for growth of a green manure plant; selection of the optimal green manure plant for this
15 particular crop system; lateral spacing of corn and soybean crops, and ingredients of a combination mulch, to name just a few.

IV. Prior Art of Record

(1) U.S. Pat. NO. US 6,631,585 (Marvin J. Williams, Jr.) discloses an intercropping
20 system for corn and soybeans. However Williams, Jr. does not disclose modified machinery for spring seeding corn and soybeans simultaneously; combination mulch, annual combination green manure, or selection and growth conditions for annual green

manure plants. Williams, Jr. also does not disclose the summer planting of a legume which remains intact in the soil to nourish a subsequent green manure crop.

(2) Ghaffarzadeh, "Economic and biological benefits of intercropping berseem clover with oat in corn-soybean-oat rotations." **Journal of Production Agriculture** 10:314-319 (1997) [hereinafter Ghaffarzadeh]. In Treatment I, Ghaffarzadeh seeded a mixture of oat and hairy vetch as a cover crop approximately one month after an oat harvest. However, hairy vetch re-growth was killed with glyphosate and seeding a cover crop was discontinued. No herbicide or fertilizer were applied to the oat crops.

For Treatment II Ghaffarzadeh seeded berseem clover with oats in the spring. For both treatments I and II, ammonium nitrate or urea were manually applied to corn subplots. Corn and soybeans were both cultivated, and in late August oat plots in Treatment I were tilled to control excessive weed growth. Pre-emergence weed growth was controlled by banding granular alachlor. Berseem clover was winter killed and was no management obstacle for corn the next spring. Berseem clover cover grew with oats and provided hay or remained as green manure. Also, for Treatment II intercropping berseem clover with oats resulted in greater economic return than sole-cropped oats. Regrowth berseem clover was left as a cover crop (green manure) to protect the soil and contribute nitrogen to the succeeding corn crop.

This study did not disclose or teach mowing and quick tilling of a green manure crop, as the clover was killed artificially during the winter to prevent regrowth. Consequently,

there is no suggestion of allocating clover portions for combination green manure and combination mulch. There is also no disclosure or suggestion of how to modify existing machinery to more efficiently seed intercropped corn and soybeans.

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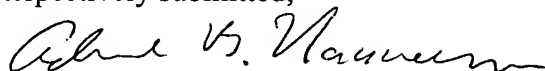
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REMARKS

1.For 112 rejections of Claim 1: "Said first portion of said combined mulch" has antecedent basis in Clause (2) which reads at the end of that clause:
"said first portion of said combined green manure becoming a combination mulch",

2. The last two clauses of amended Claim 9 are modified to accurately reflect the selection of green manure plants, and not commercial legume plants. Application, paragraph 77.

Respectively submitted,



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